



Special points of interest:

- A very dry year across western and central Wyoming
- An impressive year for wildfires
- Digital Support Services becomes NWS goal
- Staff continues its strong support of educating youth

Inside this issue:

Welcome	1
Annual Climate	2
Fire Season 2012	4
Preparing for Emergencies	6
Decision Support During National High School Finals Rodeo	7
NWS Outreach	8
Keeping Students Safe	8
Medicine Lodge Recognized as StormReady	9
Youth Education	10
Protecting Pilots	13
Hurricane Sandy	14
Webpage Updates	15
Social Media	16

Weathered Wyoming

A Stakeholder's Report for 2012—NWS Riverton, WY

A Welcome Message from Kevin Lynott—Meteorologist in Charge

As I look back to 2012, I remain proud of the productivity and quality of products and services made by the Riverton National Weather Service (NWS) office. No two years are alike when it comes to Wyoming weather. In 2012, the biggest threat to west central Wyoming was wildfire.

A few significant wildfires were watched very closely by NWS Riverton personnel. Some of the larger fires across west central Wyoming during the summer and early fall included Fontenelle, Alpine Lake, and North Buffalo. These three fires alone scorched nearly 140,000 acres of land!

However, some of the smaller acreage wildfires had the biggest impacts to life and property. The Sheep Herder Hill Wildfire burned on Casper Mountain near the city of Casper, and the Horsethief Canyon Wildfire burned near Snow King Mountain just outside of Jackson. Both fires required Incident Meteorologist (IMET) Support for about a two week period.

Mother Nature finally cooperated with cooler and wetter weather in October, so NWS Riverton could shift primary focus to other mission related

activities. Some of these activities included a Women in Science Conference, Teacher's Math and Science Conference, and Decision Support Services/Incident Command System Exercise to name a few. These were all planned and successfully accomplished with key stakeholders in 2012. Leadership enrichment also continues to be a big part of the Riverton staff, both internally and externally.

NWS Riverton continually strives to improve our technology and people, as you will see in this annual report. Therefore,

thank you for taking some time to read about our busy, yet productive year!

"...I remain proud of the productivity and quality of products and services made by the Riverton National Weather Service."



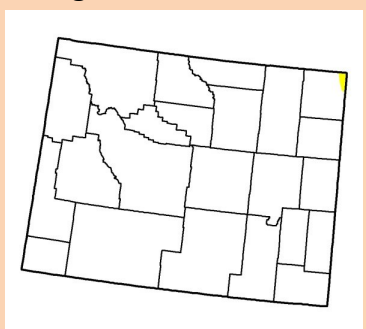
2012 NWS Riverton Staff

Monitoring the 2012 Wyoming Drought

Wyoming experienced the warmest and driest year on record in 2012. Under a second winter of La Niña, drought conditions emerged in March with low snowpack melting out early during a very dry and warm spring. Continued dry and hot conditions in June dried out vegetation and led to very large and intense wildfires. The 2012 fire season also ranked as one of the most destructive on record in Wyoming with as many as 1,400 wildfires charring more than a half-million acres. The largest single wildfire was the Arapaho Fire, which burned 98,000 acres in the Laramie Peak area in and around the Medicine Bow National Forest in southeast Wyoming. The very active fire season started early and continued through the hottest and driest March through September period since Wyoming records began being kept in 1895. The lack of precipitation and above normal temperatures are the two main factors in determining drought severity.

Drought Conditions at the End of 2011 and 2012

Drought in December 2011

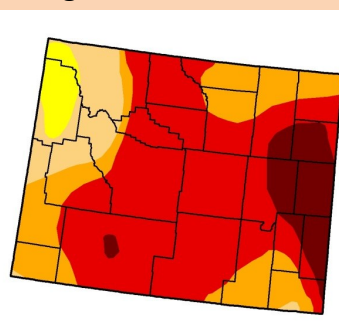


Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

According to the U.S. Drought Monitor, Wyoming was drought-free at the end of 2011. By July 4, 2012, severe drought or worse covered roughly the southeast half of Wyoming, or 52 percent of the state. Severe drought or worse covered 87.5 percent of Wyoming by Labor Day. The severity of the drought classification (D1-D4) is based on hydrometeorological variables such as precipitation, soil moisture, streamflow, and temperature.

Drought in December 2012

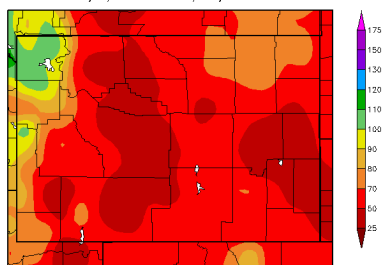


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2012 Precipitation Summary

Percent of Normal Precipitation (%)
1/1/2012 – 12/31/2012

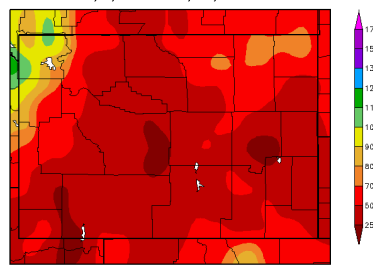


Generated 1/2/2013 at HPRC using provisional data.

Regional Climate Centers

2012 ranked as the driest on record for Wyoming with statewide average precipitation of only 8.08 inches. This was only 61% of the 20th century average of 13.17 inches. This total broke the old record set in 1988, the year of the massive Yellowstone National Park wildfires, when statewide average precipitation was 8.55 inches. Ironically, in 2012 Yellowstone National Park was the one area to largely escape drought, receiving near or slightly above normal precipitation.

Percent of Normal Precipitation (%)
3/1/2012 – 9/30/2012



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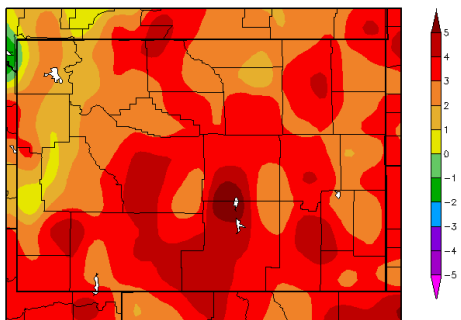
Regional Climate Centers

The seven month period from March through September 2012 stood out as an exceptionally dry and warm period in Wyoming's 118 years of record. Statewide average precipitation during this period was only 4.54 inches. March through September 1960 held the old record at 5.67 inches, so 2012 shattered this record by over an inch of precipitation.

Monitoring the 2012 Wyoming Drought

2012 Temperature Summary

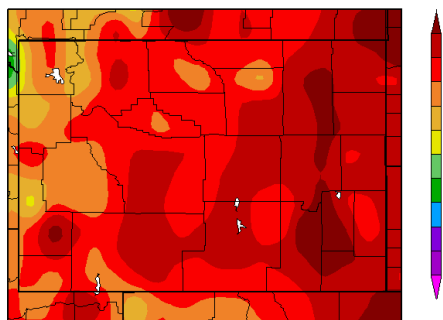
Departure from Normal Temperature (°F)
1/1/2012 – 12/31/2012



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Regional Climate Centers

Departure from Normal Temperature (°F)
3/1/2012 – 9/30/2012



Generated 10/4/2012 at HPRCC using provisional data.

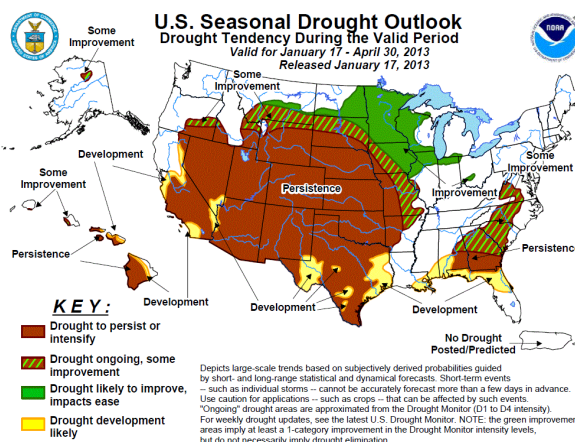
Regional Climate Centers

The year 2012 ranked as the hottest in Wyoming's 118 year period of record with a statewide average temperature of 45.6°F. This was 4.1°F above the 20th century average of 41.5°F. The previous hottest year on record was 1934 with an average temperature of 45°F. Lander set or tied 14 record highs in 2012, and no record lows were set or tied (period of record 1892-2012). Similarly, Casper tied or broke 17 record highs in 2012, and set or tied only 2 record lows (period of record 1939-2012).

Record heat in March resulted in the early melting of an already low snowpack. The warmth extended through the spring with March through May ranking as the warmest on record for Wyoming, 6.2°F above the 20th century average. This extended warmth hastened the early melt of an already-low snowpack, and caused excessive evapotranspiration from soils and vegetation – fuel for the fire. March through September 2012 was also the warmest such period on record for Wyoming with an average temperature of 56.9°F, which was 5.2°F above the 20th century average of 51.7°F. The old record was in 2007 with a statewide average temperature of 55.6°F.

Now that we've reviewed 2012, what can we anticipate for 2013? While the overall results are still difficult to determine, we do know that many areas west of the Continental Divide received above average precipitation during October through December 2012, with basin-wide snowpack near average to begin 2013. Basins across eastern Wyoming, where extreme or exceptional drought continues, have a much greater potential for drought conditions persisting well into 2013.

Drought conditions are expected to persist across drought-stricken areas of Wyoming through at least the end of April 2013. This includes almost the entire state except Yellowstone National Park and most of Teton County. For perspective, drought conditions developed over northern Wyoming in late 2000 and nearly 100 percent of the state was in drought by Spring 2002. Drought conditions generally persisted across most of west and central Wyoming through 2007. Wet springs in 2008 and 2009 improved drought conditions as all areas were free of drought by late June 2009. Similarly, it will likely take a couple of very wet years to see any dramatic improvement in the current drought conditions.



Visit our Drought Information Page:
<http://www.weather.gov/riw/?n=drought>

Visit our Snowpack Information Page:
<http://www.weather.gov/riw/?n=snowpack>

The Riverton NWS actively monitored drought conditions throughout 2012, releasing monthly drought information statements to the web. The Riverton staff also created two webpages (at left) to allow you to keep up-to-date on drought and snowpack conditions across the state. These services will continue throughout 2013. NWS personnel can also provide presentations to your group or agency regarding current conditions and seasonal outlooks.

Fire Season 2012



Smoke from the Fontenelle Fire as it inundated Fremont County in late June. Photo courtesy of Kelly Allen, NWS.

Anyone who lived through the summer of 2012 in Wyoming will be able to tell you how hot and smoky it was! Fortunately, there was a lot of preparation that went on ahead of the season by the

fire community and the local National Weather Service office in Riverton.

A below normal snowpack during the winter of 2011-12 was followed by a record breaking warm and dry spring and summer season. This set the stage for deteriorating drought conditions which contributed to some extremely dry vegetation ripe for burning. It was not surprising that numerous fire weather-related warnings, called Red Flag Warnings, were issued by the Riverton NWS because of weather conditions conducive to explosive wildfire growth. These Red Flag Warnings were issued in record numbers in 2012.

There were 20 large incidents that burned over 220,000 acres in the NWS Riverton forecast area. Two incidents were located in major wildland-urban interfaces and directly impacted thousands of people. Just about everyone in the fire community foresaw a big fire season coming in 2012 and the summer of 2012 did not disappoint.

This fire season got off to an early start due to the very low snowpack and an early snow melt. These conditions combined to generate a very long pre-green-up period, and some areas never achieved green-up. Green-up is the period when a new cycle of plant growth begins, and typically occurs each spring in Wyoming. The lack of green-up left much of the state susceptible to wildfires from March through the end of October. The prolonged period of drought this year combined with the explosive growth of fine grasses and small trees during the extremely wet winter and spring of 2010-11 resulted in a large amount of vegetation ready and available for burning. Additionally, high temperatures were in the nineties for much of the summer east of the Continental Divide with Casper, Lander, Worland, and Riverton all beating or tying records for the

most consecutive days with 90 degree temperatures. With all of the record heat and drought, all that was needed for a wildfire was an ignition source.

Mother Nature provided ample opportunity for natural ignition sources during the monsoon season, which started early at the beginning of July this year. Normally, the monsoon season brings enough moisture at the surface and aloft to produce some wetting rains along with the lightning and the wind. Not this past year. There were very few thunderstorm days that produced wetting rains; however, there were fewer thunderstorms overall this year because the monsoon was not accompanied by enough instability to allow for the growth of thunderstorms. Lightning outbreaks were fewer than feared with only three large outbreak days where lightning and a lack of rain created new fire starts. These outbreaks were well advertised and the fire community was well organized and prepared. This preparation limited the amount of wildfires that grew larger than 10 acres and serves as a testament to the caliber of people working to manage forests and wildlands. About half of the major wildfires this year were started by lightning and, of those, almost all of them were started on days that had a Red Flag Warning issued for critical or dry lightning.

The Riverton NWS office had our busiest year on record for Red Flag Warnings and provided nearly a day of advanced noticed (see table below). The first Red Flag Warning was issued on March 17 and the last of the season on October 20. The Riverton staff also produced over 450 site-specific forecasts in support of fires and other hazardous events.

Red Flag Warnings	487
Number of days with critical Red Flag Warning conditions	62
Avg. Warning Lead Time	22 hrs.
Probability of Warning	96%
False Alarm Rate	5%

Fire Season 2012—continued

There were 20 large fire incidents this year, many of which were human-caused. In fact, the largest three wildfires were either human-caused or of unknown origin. The largest wildfire of the season in the NWS

**“Mother
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Riverton service area was also the earliest large fire. The Fontenelle Fire was started June 24 in the Bridger-Teton National Forest, about 18 miles west of Big Piney. Some portions of the 64,220 acre fire moved into BLM and private land. The cause of the fire is still under investigation.

The most expensive fire to fight was the Horsethief Canyon Fire near Jackson, which cost over \$9 million to suppress. The fire began September 8 just south of Jackson and was human-caused. It spread rapidly north but was stopped before it hit the Cache Creek drainage, which would have immediately threatened

the town of Jackson. An evacuation advisory for east Jackson was issued on September 10 in the event the fire could not be held at the ridge above Cache Creek. This advisory was in place for four days and directly affected nearly 3,000 people.

The fire that caused the greatest damage in the NWS Riverton service area was the Sheep Herder Hill Fire that burned nearly 16,000 acres on the east side of Casper Mountain. This fire was started by human activity on September 9, while a Red Flag Warning was in effect. The fire started near Casper Mountain Road on Sheep Wagon Hill and quickly spread east, forcing 400 residents to leave their homes. Critical weather conditions continued on September 10, fanning the flames and growing the fire by 5,000 acres in one night. By the morning of September 11, the fire perimeter had doubled in size reaching 15,000 acres. Weather conditions improved September 11 and additional resources arrived. These resources included one of two nationally available DC-10 aircraft capable

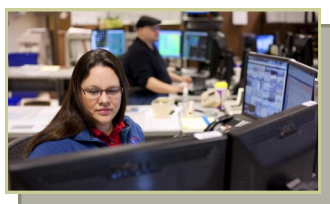
of transporting a nearly 12,000 gallon payload. Even with the extraordinary response from Natrona County and the fire fighting community, 37 residences were lost along with 23 outbuildings. Additionally, over 850 structures were threatened and nearly 1,000 people were either told to evacuate or to be ready to evacuate at a moment's notice. These three fires accounted for 38% of the total acres burned in 2012 across western and central Wyoming.

There was a lot of interagency communication and behind the scenes preparation and planning before the season officially began. The Riverton NWS held seven preseason interagency meetings in the early spring with our partners in and around Lander, Cody, Worland, Casper, Kaycee, Rock Springs, and Jackson. These meetings allow the NWS to discuss the upcoming season, procedural changes, and new communication services. One new service was a heads-up email program that provided early alert to the possibility of critical fire weather conditions. Multimedia video weather briefings and an effort to increase warning lead times were also implemented.

The NWS will maintain these practices into the future, as well as continue to be on the cutting edge of dry lightning research by contributing to an interagency study on how to best communicate the threat of forecast lightning episodes. Communication between the fire community and the Riverton NWS was outstanding in 2012. Very importantly, the fire fighting and land management communities should be commended for incredible performance during the 2012 season.



The Sheep Herder Hill Fire as seen from east Casper looking east. Photo courtesy of Cordell Anthony.



Did You Know?

The National Weather Service office in Riverton is staffed 24 hours a day, 7 days a week, 365 days a year. There is always at least one meteorologist on duty to answer your questions. Call us at 1-800-211-1448!

Working Together to Prepare for Emergencies

“These in-house exercises have helped develop new ideas, procedures, and guidelines that are currently being implemented.”

In early November, NWS Riverton hosted a tabletop exercise for several core partner emergency management and service agencies. The exercise was attended by over 45 people and was held at the Wyoming Fire Academy in Riverton. The exercise was designed by a group of NWS Riverton employees to address the use of NWS services in support of emergency functions and to make everyone better aware of the multiple communication options available.

A tabletop exercise attempts to simulate an emergency incident in an informal environment. These types of exercises are designed to get participants discussing their roles and actions, and to familiarize the players with their roles, procedures, and responsibilities. The exercise is typically led by a facilitator who essentially guides participants through a scripted play. The main focus of the group is to solve problems and identify areas for improvement. A team of three evaluators observed the interactions and actions of the participants and provided feedback. An After Action Report was written which detailed findings and recommendations from the exercise.

The exercise scenario involved a complex winter storm and was

complete with road closures, overturned trucks, missing hunters, stranded school buses, and power outages. Participating agencies included county and tribal emergency management, Wyoming Office of Homeland Security, public health, Wyoming Department of Transportation, regional response team, and the NWS. Each of these agencies was exercised in some capacity during the course of the day. Engagement was high, discussion was helpful, and in the end the findings and recommendations should make for better emergency response down the road. The current plan is for the NWS to host one such exercise in Riverton each year to exercise emergency response to differing weather incidents.

This NWS-hosted exercise built upon previous in-house exercises conducted at NWS Riverton. Twice in 2011 and again in May 2012, the NWS Riverton put their staff through the paces of winter and summer weather exercises. These in-house exercises have helped develop new ideas, procedures, and guidelines that are currently being implemented. In addition, the exercises have uncovered opportunities for enhancing partnerships and improving both internal and external communication.



NWS Riverton Provides Decision Support During National Rodeo

NWS Riverton provided decision support for nearly two weeks in July to county emergency officials working at the National High School Finals Rodeo (NHSFR) at the Sweetwater Events Complex in Rock Springs.

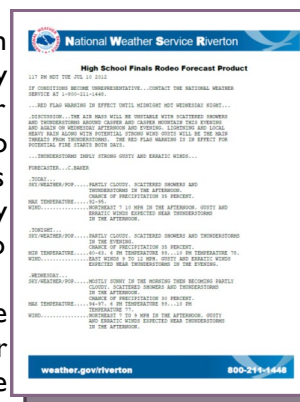
NWS Riverton meteorologists provided site specific forecasts each morning prior to the daily incident command briefing. County emergency management, law enforcement, and fire officials used the weather information to plan accordingly for the day's activities. The Riverton staff also provided updates to incident command concerning hazardous weather, such as approaching thunderstorms. These updates were then relayed by incident command to venue and National High School Rodeo Association officials so proper safety precautions could be undertaken.

Many rodeo contestants and their families stayed onsite at one of the venue's 1,220 campsites. This added an additional level of concern for emergency planners as an estimated 7,000 to 10,000 people were encamped on the 410-acre property. NWS Riverton staff was aware of the unique challenges since the incident management team began planning for the NHSFR in the fall of 2011.

"Emergency officials at the city and county levels were aware of how we could be of service and ensured we were part of the planning process," said Chris Jones, Riverton NWS warning coordination meteorologist. "Attending the planning team meetings enabled us to discuss weather safety concerns with incident command and better understand the logistics of hosting an event of this complexity."

Former NWS Riverton forecaster Dan Berc developed a weather and safety brochure specific to Sweetwater County and the Rock Springs area which was distributed in informational packets at contestant registration. "We felt it was important to familiarize visitors with what to expect weather-wise in southwest Wyoming, including actions the visitors could take to prepare and protect themselves during the rodeo," said Berc. "In a small way, it helps in developing a Weather-Ready nation."

Sweetwater County will play host to the NHSFR through 2015, so the NWS expects to remain an integral part of incident command. At the conclusion of the event, county emergency manager David Johnson wrote to say thanks "for the outstanding job the NWS Riverton did during the 2012 National High School Finals Rodeo. NWS Riverton was an important part of our Incident Command, and the weather reports we received were spot on. I look forward to NWS Riverton being a partner in the future NHSFR events."

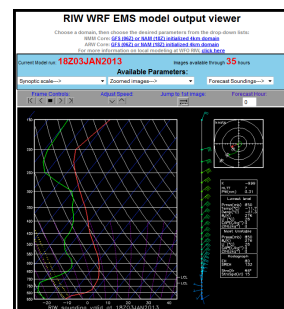


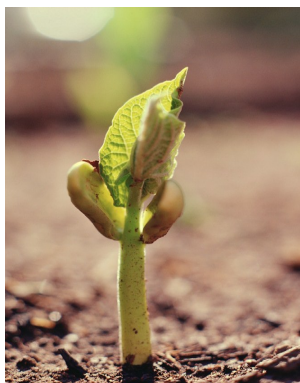
Sample NWS Forecast for the NHSFR



Attention Weather Enthusiasts!

If you have an interest in weather forecast models, you'll be interested in this news! At NWS Riverton, we run a local model called the Weather Research Forecasting (WRF) Model. Our set-up of the model includes a higher resolution, and is focused primarily over our forecast area of western and central Wyoming. Graphics from this model are now available online! Simply visit: <http://www.weather.gov/riw/wrf> to view the output from our locally run numerical model!





NWS Riverton continued its outreach efforts with the agricultural community, as well as others.

“...Riverton staff conducts at least three...outreach activities each month reaching hundreds of people.”



NWS Riverton reached out to the Wyoming Pupil Transportation Association in 2012

NWS Riverton Continues Outreach Efforts

Each year the staff at NWS Riverton gives office tours and numerous presentations on various topics to community groups and the general public across western and central Wyoming. Not including the flagship spotter training and fire weather programs, the Riverton staff conducts at least three of these outreach activities each month reaching hundreds of people.

One targeted outreach group in 2012 was again the agricultural community. Presentations were provided at two farm and ranch days in the Big Horn and Wind River basins.

Additionally, office staff was called upon to provide various hydrologic and drought updates to community groups and organizations. These included the Farm Service Agency and Farm Bureau. In 2012, NWS Riverton also generated 8-to-14 day outlooks to assist farm and ranch planning. This forecast played daily on [All Hazards NOAA Weather Radio](#) from April through October.

The staff at NWS Riverton always strives to develop presentations to fit the needs, both in content and length, of the organizations with which they will be speaking. Over the years this has

led to unique and diverse opportunities like those of 2012 which included, the Wyoming Association of Fire Chiefs, Conoco Phillips, Jackson Hole Astronomy Club, Lander Lights On, Rotary clubs, and Pacificorp Retirees. Presentations to individual school classrooms and school tours to the NWS are also a big part of the outreach undertaken. If you are part of a group, organization, or school that is interested in hearing from a NWS meteorologist, please contact Warning Coordination Meteorologist Chris Jones (857-3898 ext. 726) to arrange a visit.

Helping Decision Makers Keep Students Safe

C r i s s c r o s s i n g Wyoming by vehicle each winter always has its share of exciting moments. Now, just imagine you are steering a 40-foot bus with 60 kids inside? That might make your decision to travel or which route to travel even that much more important. A primary mission of NWS Riverton is to provide the traveling public with the best possible weather information to assist you in making safe travel and smart decisions when it

comes to winter weather. This past year NWS Riverton had the opportunity to meet with the membership of the [Wyoming Pupil Transportation Association](#) to share how the agency might assist those charged with ensuring safe travel of Wyoming's school aged students.

Warning Coordination Meteorologist Chris Jones spoke at the WPTA's supervisor's conference in April, a meeting that drew

transportation officials from school districts across the state. The conference afforded the NWS the opportunity to discuss and demonstrate the numerous communication options and NWS decision support services. Specifically highlighted was the fact that meteorologists are available 24 hours a day to answer questions related to forecast weather and travel conditions. That means a school transportation

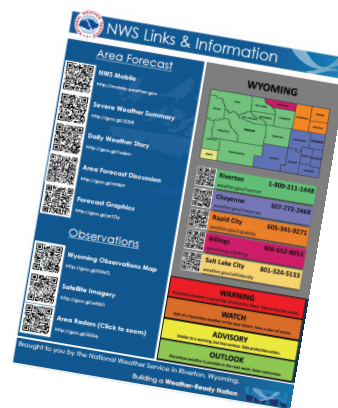
official can call anytime to discuss intended travel routes or the ability for a bus to travel. Other topics included internet-based forecast tools, the NWS mobile.weather.gov weather forecast site for Smartphones, social media, and the WYOLink communications system.

Former NWS Riverton meteorologist Reid Wolcott followed-up with a separate presentation to the WPTA's entire membership at a June

meeting in Casper. Wolcott was able to directly interface with the drivers who are responsible for transporting Wyoming students across the state each school year. Wolcott created and distributed a very useful two-page hand-out complete with website and QR code links to essential weather, travel, specific city forecasts, and important NWS contact information. The hand-out has become one of the more popular outreach materials NWS Riverton distributes. You can download

your own copy at:

<http://www.crh.noaa.gov/images/rivw/WeatherRefSheet.pdf>.



Medicine Lodge Recognized as First StormReady® State Park

Medicine Lodge State Archaeological Site was recognized in May as the first StormReady Wyoming state park or historic site at a ceremony held at Medicine Lodge on Wednesday, May 30, 2012. WFO Riverton Warning Coordination Meteorologist Chris Jones made opening remarks and presented a recognition letter and certificate to Medicine Lodge Superintendent Brooks Jordan.

Superintendent Jordan was the project leader for ensuring Medicine Lodge met all necessary requirements for StormReady designation. WFO Riverton Meteorologist in Charge Kevin Lynott presented Superintendent Jordan with two StormReady recognition signs for display at the

park. Others in attendance for the ceremony included Wyoming State Parks, Historic Sites, and Trails (SPHST) Administrator Domenic Bravo, SPHST Region 3 Manager Mike Allen, Big Horn County Emergency Manager John Hyde, and Washakie County Emergency Manager Kimball Croft.

Medicine Lodge, a small state park along Medicine Lodge Creek in northern Wyoming, averages approximately 20,000 visitors each year. The park is nestled in a location that is prone to strong summer thunderstorms with outflow wind and lightning the primary hazards. Another threat to Medicine Lodge is spring snowmelt flooding. In 2011, flooding caused by melting of an historic snowpack in late June

caused rapid rises along Medicine Lodge Creek. The flooding prompted nighttime evacuations of campers as the water spilled across roads and campsites.

Working with the NWS, Superintendent Jordan developed improved communication methods to ensure park staff can be reached any time, day or night, to be notified of impending hazards. He also enhanced site communications to provide improved distribution of weather hazards information to visitors in the park. WFO Riverton Forecaster Kelly Allen in conjunction with Superintendent Jordan developed an informative site-specific weather safety guide that is now distributed to park visitors.



Medicine Lodge State Archaeological Site Superintendent Brooks Jordan (second from left) is joined by, from left, Wyoming State Parks, Historic Sites, and Trails (SPHST) Region 3 Manager Mike Allen, Wyoming SPHST Administrator Domenic Bravo, and WFO Riverton MIC Kevin Lynott at the StormReady presentation.



NWS Riverton Continues Strong Support of Youth Education



Students at the Women in Science Conference on October 12, 2012.

“NWS Riverton employees have actively led, designed, and promoted STEM activities...”



Students at the Women in Science Conference on October 12, 2012.

Throughout 2012, employees at the National Weather Service (NWS) in Riverton, Wyoming have been encouraging students to learn more about Science, Technology, Engineering, and Mathematics (STEM) fields and career opportunities through various educational and learning activities. NWS Riverton employees have actively led, designed, and promoted STEM activities through various approaches and our efforts have made a significant impact on the youth of Wyoming.

Exploration and learning were encouraged through the Women in Science Conference, Outdoor Education Expo, Wyoming Math and Science Teachers' Conference, job shadowing, school/civic talks, and assorted educational initiatives. Due to the size, scope, and impressive nature of these activities a detailed account of each is provided.

Women in Science Conference

One of several important STEM activities, the Women in Science Conference included significant time and planning by staff members of the NWS office in Riverton. Four staff members of NWS Riverton serve on the board and committee of Women-Men in Science – a federally recognized non-profit entity aimed at introducing STEM related careers to Wyoming youth. Board members include Chairperson Katy Branham (General Forecaster), and Secretary Peggy Peterson (Electronic Technician). Kevin Lynott (Meteorologist-in-Charge) and Kelly Allen (General Forecaster) serve as members of the committee.

The 2012 Women in Science Conference was held on October 12, 2012, at Central Wyoming College (CWC) in Riverton. The conference is a day-long event for young women in grades 7-12 from across much of central and western Wyoming. This year's event hosted around 300 students, 20-25 teachers, 19 speakers, 15-20 career exploration booths, 30-40 volunteers, and 10 committee/board members. There were 12 schools represented at the conference, with approximately a third of the student tally being from schools on the Wind River Reservation (Wyoming Indian Middle & High schools). Kemmerer Alternative School traveled the greatest distance to attend, driving approximately three hours one way to participate. Several other schools made drives of 1.5-2.5 hours one way. A number of schools from Fremont county (NWS Riverton's home county) were also in attendance. In addition to those physically in attendance, the Women in Science conference utilized the Wyoming Equality Network's (WEN) video conferencing capabilities and were able to host several additional schools in all portions of the state.

Planning for the 2012 Women in Science Conference began in December 2011, and continued steadily through proceeding months, with meetings becoming as common as weekly by September 2012. The four aforementioned NWS employees worked with three staff/faculty members of CWC, two teachers from the Wind River Reservation, two members of the community, and one representative from the Wyoming Council for Women's Issues to plan the event.

Committee members arrived early on the day of the event to begin decorating the CWC gym. The gym serves as the venue for the opening ceremonies, booths, breakfast, and lunch. Students began to arrive around 8:00 a.m., with the first of two “break-out” sessions starting around 9:30 a.m. During

the “break-out” sessions students receive interactive introductions to STEM related careers. All speakers are strongly encouraged to provide a hands-on learning experience where students can truly understand job opportunities within a specific career. Sessions at the 2012 Women in Science Conference included neutering a dog, dissecting cow eyeballs, investigating crime scenes, animal first aid/fruit suturing, and introductions to additional fields such as wildfire biology, hydrology, nursing (military and civilian), oil rigs, and others. The first session was followed by a keynote speaker, lunch, a second “break-out” session, and closing ceremonies. The day ended for committee/board members around 2:30 p.m.

The NWS in Riverton also participated in the Women in Science Conference by bringing a booth to the event. The booth featured many interactive elements, and was staffed by Curt Lutz (Electronic Technician), Rob McFall (Electronic Systems Analyst), Chris Jones (Warning Coordination Meteorologist), and Brett McDonald (Science & Operations Officer). In addition to leading the booth, several members served as volunteers during the day. Nancy Eustice (Information Technology Officer) and Kathleen O’Leary (Administrative Assistant) helped to guide students to their “break-out” sessions.

The 2012 Women in Science Conference was extremely successful, and very positive feedback was received from students, teachers, and speakers. Plans are in the works for a Men in Science Conference (for young men in grades 7-12) in the fall of 2013.

Outdoor Education Expo

Staff from NWS Riverton participated in the third annual “Outdoor Education Expo” at the CWC Sinks Canyon Center near Lander, Wyoming. This day-long event was held on September 28, 2012, for all fourth graders, approximately 130 students, from elementary schools in Lander. This conference is designed to get students out of the classroom and into a natural setting to learn about and reconnect with the natural world around them.

Inspiration for this event came from Richard Louv’s landmark book “Last Child in the Woods.” Louv identified a phenomenon many knew existed but couldn’t quite articulate: nature-deficit disorder. Louv wrote of the many benefits to children who engage in nature play: increased self-esteem, improved psychological and physical health, and reduced stress, just to name a few. NWS Riverton was the leader in establishing a coalition of local, state, and federal government agencies along with private and non-profit organizations to develop this unique event. This coalition has grown to include: CWC Sinks Canyon Center, U.S. Forest Service, U.S. Fish & Wildlife Service, Bureau of Land Management, Wyoming Game and Fish Department, Audubon Society, Wyoming State Forestry, University of Wyoming Agricultural Extension, Popo Agie Conservation District, Central Wyoming College, National Outdoor Leadership School, and the National Weather Service.

Ten groups of 13 students rotate through 10 hands-on learning stations spread across pastures, orchards, rock-outcroppings, and meandering waters at the 127-acre Sinks Canyon Center campus. The 4th graders were led by college students studying within CWC’s outdoor education and leadership degree program. The learning stations included hands-on activities focused on Leave No

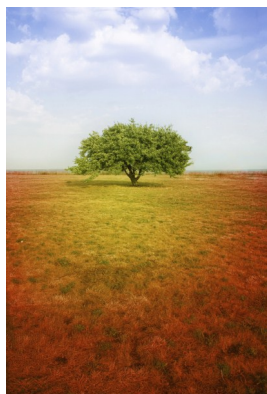
“This conference is designed to get students out of the classroom and into a natural setting to...reconnect with the natural world around them.”



Students visit the “Weather” Learning Station at the Outdoor Education Expo



Students in attendance of the Outdoor Education Expo



NWS Riverton Continues Strong Support of Youth Education

Trace Principles, Geology, Bird Identification, Weather and Water, Identifying Wildlife, Tracks and Scat, and Trip Planning. Learning how to safely wade a river, proper use of inert bear spray, viewing birds through scopes and binoculars, and touching the various animals skins and horns/antlers, were just a few of the highlighted activities.

Each student receives a 30-page outdoor education passport at the beginning of the day that serves as part workbook, part guidebook. At the conclusion of each learning station, the student's passport is stamped by the station leader. The passport provides a great way for students to reflect back on what they learned and keep memories of this special day. The day concluded with the gift of a new fishing pole for each student provided by the Wyoming Game & Fish Department.

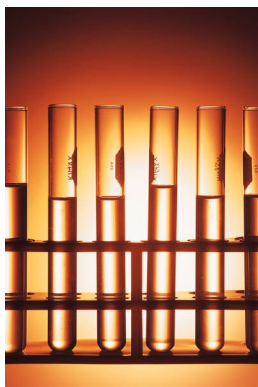
The Riverton NWS station was staffed for the third year by Brett McDonald (Science & Operations Officer) and Chris Jones (Warning Coordination Meteorologist). For the first time, the expo was held on a day that had clouds, which helped discussions about cloud formation and how to read the clouds and remain safe! (The first two events were held under cloudless skies, which made for imaginative learning.) Brett and Chris discussed weather safety, the differences between weather and climate, how meteorologists measure the weather, and cloud development and identification. Their finale was showing how clouds are formed by producing a cloud in a bottle. This experiment provides a great way for students to understand how temperature, pressure, and moisture all play a role in cloud formation.

Warning Coordination Meteorologist Chris Jones has compiled the planning team's work into a 30-page curriculum guide. The guide, which outlines how school districts or other organizations can organize their own Outdoor Education Expo, will soon be available through CWC and the NWS.

Math and Science Teacher's Conference

Staff from NWS Riverton took part in the Wyoming Math and Science Teachers' Conference which was held October 15th and 16th in Casper, Wyoming. This conference is aimed at encouraging math and science teacher networking. This was NWS Riverton's third time participating in this event that draws teachers from all corners of the state.

The NWS in Riverton participated in two different aspects of the conference. The first of these was to have a table where teachers could approach NWS Riverton staff to ask any questions they may have regarding our classroom (and other) services. Kelly Allen (General Forecaster), Brett McDonald (Science & Operations Officer), and Dan Berc (General Forecaster) were representatives at the table over the two days. Additionally, Dan Berc conducted an hour-long teacher break-out session titled, "Utilizing National Weather Service Educational Tools in the Classroom" where he described in-depth how to best utilize our products and services in the classroom.



Out and About...

Staff from the National Weather Service in Riverton conduct even more outreach and education support than was described in the preceding article. Here are a few more examples of activities staff of NWS Riverton participate in/lead throughout a typical year:

- Central Wyoming College regional and individual school science fairs
- Office Tours
- Job Shadows
- Rock Springs Resource Rendezvous
- Lander Children's Museum

Protecting Our Pilots

Between October 2010 and October 2011, ten people perished over the Wind River Mountains in central Wyoming. This striking number prompted staff at NWS Riverton to try to take more of an initiative to educate area pilots on the dangers associated with mountain flying.

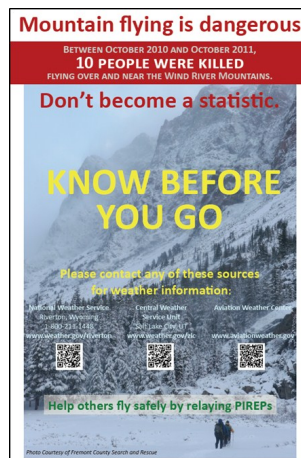
After discussion within the office, several outreach materials were created. The first and most prominent was the creation of a poster warning pilots to be aware of the hazards associated with mountain flying. Additionally, within a few months, a tri-fold pamphlet was created with resources pilots may want to use when trying to decide whether to fly through mountain passes.

Our primary aviation responsibilities include nine (9) airports across the forecast area. Staff from NWS Riverton spent time visiting with three airport managers. During these meetings, staff distributed handfuls of the pamphlets and posters to managers who were willing to display the information at the fixed base operator or pilot briefing area.

In September, NWS Riverton aviation program leader Katy Branham conducted a presentation at the Wyoming Airport Operators Association's (WAOA) annual conference. Many statewide managers were in attendance at the WAOA Conference, including several who came from airports outside the boundaries of the NWS Riverton service area. A large number of the managers were approving of completed outreach efforts, taking multiple copies of the outreach materials discussed during the presentation.

Also present at the WAOA Conference was a representative from the National Transportation Safety Board (NTSB). NWS Riverton's presentation caught the eye of the NTSB representative, who discussed additional items with the staff after the presentation was over. A partnership has begun between the local NTSB representative and the NWS to attempt to promote awareness of the dangers of mountain flying. It is everyone's hope to help lower the number of fatal aviation crashes, especially related to mountain weather.

***"A partnership
has begun...to
promote
awareness of
the dangers of
mountain
flying."***



**Mountain Flying Poster
created by NWS Riverton**

National Weather Service's National Week of Service

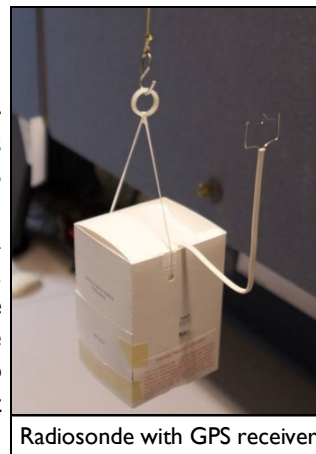
Along with the majority of NWS offices across the country, NWS Riverton participated in the National Week of Service in October. To help give back to our local community, NWS Riverton staff held an in-office food drive. Food collected during the event was given to the Riverton Community Food Bank.

NWS Riverton's Efforts with Hurricane Sandy

What does the Riverton forecast office have to do with forecasting hurricanes? Well, more than one would think!

There are about 100 sites in North America, the Pacific Islands, and the Caribbean (over 800 sites across the planet) that routinely release weather balloons 2 times per day, at the same time each day at 00Z and 12Z (5AM and 5PM MST). NWS Riverton is one of these sites.

Attached to the weather balloon is a parachute and an instrument package called a radiosonde. The radiosonde package includes instruments that measure pressure, temperature, and relative humidity. A small battery operated transmitter on the radiosonde transmits the data from the instruments as well as the position of the balloon, back to a receiver on the ground. The GPS tracking data are used to compute the wind speeds aloft. The weather data collected by the instrument package are then used as input for global forecast models.



Radiosonde with GPS receiver

An example of an equation used by a forecast model

$$\sigma = RH^{k_1} \left[1 - \exp \left(- \frac{k_2 q_i}{[(1 - RH)q_s]^{k_3}} \right) \right]$$

The equation for cloud cover used by the GFS (Global Forecast System) - other equations are used for each weather element at every layer of the atmosphere from the surface to nearly 100,000 feet above the earth's surface. The data from the weather balloons are used to populate these equations. Computer models then turn these equations into graphical representations of the weather up to 14 days into the future. These graphic representations are interpreted by a forecaster and are translated for the general public into a forecast. (Imagine if we had to calculate all of these equations by hand every 6 hours!)

In addition to the "routine" 00Z and 12Z launches, it was requested that offices provide upper air observations for the "off-hour" runs of the global forecast models, which are run at 18Z and 06Z (11AM and 11PM MST). Typically the "off-hour runs" of the models use interpolated upper air data from the 00Z and 12Z runs and are often less accurate. So, when high impact systems approach the United States, four launches per day is often requested in support of more accurate model runs. Because of the anticipated impact of Hurricane Sandy on the eastern seaboard with widespread gale to hurricane force winds over densely populated urban areas - the National Weather Service did everything in its power to give those who were affected as much warning as possible so that they could plan accordingly or get out of harm's way. The National Hurricane Center was able to predict the location of land fall five days in advance with remarkable accuracy, despite the fact that this storm was an anomalous event.

What does that have to do with the NWS in Riverton? At the time when Hurricane Sandy was moving north in the Atlantic, a cold low pressure system was bringing snow to the Intermountain West. This system eventually interacted with Hurricane Sandy, affecting her track and transition from a tropical, warm-core system to a cold core extratropical system that would bring large amounts of snow and cold temperatures to New England. So, forecasters at the National Hurricane Center and the National Weather Service offices in New England needed to sample the storm as much as possible as it passed across the Intermountain West.

National Hurricane Center's Forecast Track of Sandy



The National Hurricane Center put this forecast out on Thursday, October 25, 2012. This forecast was made five days before Sandy made landfall in New Jersey, as predicted by weather forecast models.

Webpage Improvements

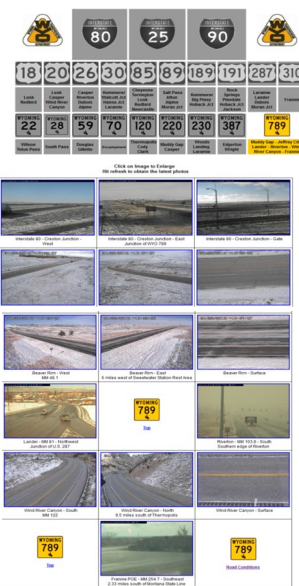
Web Cameras by Route

The Wyoming Department of Transportation (WYDOT) has continued to expand their network of web cameras across the state. NWS Riverton's original mosaic webpage that displayed thumbnail images of these cameras on one page began to get very long. NWS Riverton recently divided WYDOT's network of web cameras by highway route. These new pages allow for quick access to web cameras of interest and enable larger thumbnail images to be displayed. These popular webpages have elicited very positive

feedback from customers and WYDOT. These mosaics have expanded beyond WYDOT to include the Wyoming Department of Environmental Quality's network and Wyoming's national and state parks. NWS Riverton is currently in the process of developing mosaics for the numerous private web cameras across Wyoming.



Occasionally you may spot something more interesting than traffic as you pan through the images. (Tornado in northern Colorado as seen from the WYDOT web camera at I-25 & College Drive in Cheyenne)

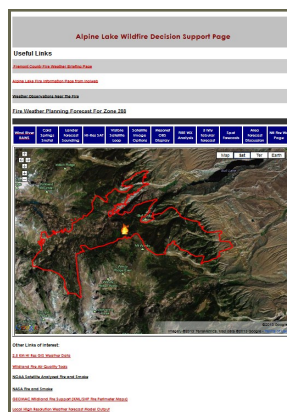


Mosaic for Highway 789 with images from south of Creston Junction north to Frannie. You can click on any route at the top of the page to select it. Clicking on the image will enlarge it. Clicking on the "Loop" link will bring up a window that will display the last 12 hours of the particular image in one hour increments.

Wildfire Decision Support Webpages

In a further effort to keep the people of western and central Wyoming informed of major events going on near their homes, NWS Riverton has begun to create Wildfire Decision Support Services websites. These pages, originally designed by NWS Denver, are created for wildfires classified as major and contain a wealth of information on area wildfires. Fire

perimeter, forecast, and public announcement information, along with links to additional weather sites are all available on these webpages. These pages will be made available throughout 2013 to support wildfire crews and area residents during major wildfires. Be looking on the NWS Riverton website "Top News of the Day" throughout the summer.



Sample Wildfire Support Page from Alpine Lake Wildfire



Hellos and Goodbyes...

As is typical in a National Weather Service office, NWS Riverton saw the departure and hiring of staff members during 2012.

An opening for a General Forecaster in the Riverton office was filled in February when Chris Hattings joined the team from the NWS office in Pocatello, ID.

In July, Meteorologist Intern Reid Wolcott received a promotion to become a General Forecaster in the Las Vegas, NV office.

A second team member, General Forecaster Dan Berc, headed to Las Vegas in November. Dan was promoted to the position of Warning Coordination Meteorologist after serving the Riverton office for nearly six years.

We continue to wish all of our former co-workers the best in their future endeavors, and welcome those new staff members who join the NWS Riverton team.



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Useful QR Codes

NWS Riverton Website



NWS Riverton Facebook Page



NWS Riverton Twitter Page



National Weather Service Riverton - Protecting Life and Property

The history of NWS Riverton began in Lander in 1891, shortly after Congress created the Weather Bureau. Forecasting and observations were generated at the Lander office until 1996, when the current facility opened in Riverton. NWS Riverton creates forecast information for 11 counties across central and western Wyoming, with elevation ranging from just below 4,000 ft to 13,800 ft. There are 23 members of the NWS Riverton staff, with a meteorologist on duty 24 hours a day. The NWS in Riverton is operated 24 hours a day, 7 days a week, 365 days a year, and forecasters are always available via phone.



Expanded Social Media Presence

The National Weather Service office in Riverton continues to expand its social media presence. The office joined Twitter (e.g., @NWSRiverton) in September. Meteorologists in Riverton monitor partner Facebook/Twitter accounts (e.g., media outlets, emergency managers, etc.) as well as common weather hashtag words or phrases (e.g., #wywx, #yellowstone, etc.). This has allowed our office to attain more time critical weather data and reports that we would otherwise never



NWS Riverton has embraced the usage of social media, and actively uses its Facebook and Twitter accounts. We encourage our users to join us!

have received. Facebook and Twitter are other avenues you

can use to keep abreast on the local weather, and to communicate with the National Weather Service. On our Facebook (facebook.com/US.NationalWeatherService.Riverton.gov) and Twitter accounts (twitter.com/NWSRiverton) we routinely post daily graphical weather forecast, news stories about upcoming storms and storm summaries (e.g., snowfall totals), and requests for storm reports such as snow amounts or damage caused by storm(s).